NETWORK INTERFACE UTILIZATION DEPENDENT CHARGING DETERMINATION

FIELD

[0001] The present invention relates to network interface utilization dependent charging determination. More specifically, the present invention exemplarily relates to measures (including methods, apparatuses and computer program products) for realizing network interface utilization dependent charging determination.

BACKGROUND

[0002] The present specification generally relates to charging determination procedures in network deployments with respect to a transmission of data from a terminal to another terminal during a session transited via a plurality of networks operated by a plurality of network operators. In general, in such network deployment of a plurality of networks operated by a plurality of network operators, the amount of the transmission session performed in each of the involved networks operated by an operator, respectively, is to be determined in order to account for the occurred traffic between the involved operators.

[0003] The 3GPP TS 29.165 defines an Interconnect Border Control Function (IBCF) as the IP Multimedia Subsystem (IMS) network element located at the border between interconnected networks. The IBCF is capable of performing IMS charging for traffic delivered from one network to another. The 3GPP TS 32.260 specifies the charging interface of such IBCF based on the known authentication, authorization and accounting protocol Diameter for reporting the delivered traffic to an OFfline Charging System (OFCS).

[0004] In an end-to-end IMS communication, e.g. in an IMS session between two terminals, the IBCF can be deployed in each transited IMS-based network at the borders to neighboring networks. Interconnection case complexity for a IMS session can range from direct interworking of an originating and a terminating network up to the scenarios where the session path of the IMS session intersects a series of multiple networks. Such complex scenarios occur when the UE, that is, one of the involved terminals, is roaming in a visited network, or, in case of indirect interconnections, when an IMS session is routed to its destination via one or more transit networks.

[0005] The IBCFs deployed on either side of the NNI (Network to Network Interface), that is, on each side of the border between interconnected networks, perform session-based or event-based charging by way of sending accounting requests (ACR) to the OFCS. Session-based charging means that the consumed charge units are continuously accumulated during the session, which may exemplarily be implemented as charging per byte of upload/download transmission. In contrary, event-based charging means that for a certain event a predetermined number of charge units is consumed independent of the byte number or time length of the transmission corresponding to the event.

[0006] The Diameter ACRs carry a set of charging parameters characteristic for the particular chargeable event or session. This set is specified in the 3GPP TS 32.260 with the syntax definitions in the 3GPP TS 32.299. Subsequently, the OFCS transforms the received charging parameters into Charging Data Records (CDR) for a Billing System (BS). Using the CDRs, the BS is able to account for the occurred traffic between the involved operators of the transited session, that is, between the operators of networks involved in the IMS communication of the transited session. The payment incurred by the IMS communication thus primarily relies on a set of charging parameters, which should be comprehensive enough for the operators to recognize which of the traffic cases has been recorded by a particular IBCF in order to assign the corresponding tariff for inter-operator accounting.

[0007] Multiple logical IBCF instances can be involved in the path of a single IMS communication scenario, which will result in multiple ACRs sent from the same network element type and consequently in multiple CDRs from the same network element type compiled for the BS. Although the actually handled chargeable event on each segment of the signaling path may for each instance concern different interconnection partners and be subjected to different payment flows or tariffs, the standardized CDR parameters fail to carry enough charging information to allow such traffic classification, i.e. to allow distinguishing between the indicated different conditions of the chargeable events.

[0008] To achieve such distinguishing between traffic cases, i.e. between the indicated different conditions of the chargeable events, one (logical) IBCF instance can be dedicated to one (physical) IBCF node. A logical IBCF instance is the functioning of a network node as an IBCF for a certain IMS session, whereas the physical IBCF node is the network node itself. Such dedication would considerably decrease efficiency of network resources utilization.

[0009] The 3GPP TS 32.260 defines a charging parameter identifying involved operators among each other related to transiting a session. Namely, a Transit Inter Operator Identifier (Transit-IOI) deals with scenarios of interworking between multiple IMS networks. Each network involved in the IMS session forwards its identity to its neighboring networks through Session Initiation Protocol (SIP) signalling. As a result, the CDR generated with respect to each network can contain the received list of involved networks between the originating and the terminating networks. Hence, an accounting based on the list of involved networks between the originating and the terminating networks may be applicable.

[0010] The proposed principle solves charging problems in interworking scenarios. However, according to 3GPP TS 24.229, the IOI parameters are not shared between the interconnected networks for IMS sessions on the path between the HPLMN and VPLMN, which may cause difficulty in identifying properly any transit network operator between the roaming partners. Consequently, the proposed principle is not fully appropriate for traffic between the Visited Public Land Mobile Network (VPLMN) and the Home Public Land Mobile Network (HPLMN) in a roaming scenario. In addition, the charging results according to this proposed principle are only reliable when the operators are in a trusted relationship with each other. A prevention of manipulating the list is not shown in the stated technical specification (TS). Hence, an untrusted partner may sometimes be suspected to fraudulently manipulate the values in the list to increase the own revenue while keeping the basic SIP delivery mechanism unaffected. Thus, even if the Transit-IOI is available in charging, the necessary reliability of such information is not always derivable from the CDR.

[0011] The 3GPP TS 23.850 focuses on an optimal media routing in an IMS roaming scenario. For correct charging of various roaming sub-variants, the study recommends for the inter-operator charging a selective usage of a CDR generated